1977: Lederman and the Discovery of the Upsilon

About Leon Lederman: He earned his Ph.D. at Columbia University in 1952. Lederman and his partners were awarded the Nobel Prize in Physics in 1988.

What is the Upsilon?

- A sub-nuclear particle that is formed from a bottom quark and its antiparticle and is about 10 times heavier than a proton.

The Experiment:

Lederman and his team studied what occurs when a proton beam from the accelerator collides with a platinum target, producing a pair of either muons or electrons.

In May of 1977, however, data-taking was halted for four days when a fire broke out. Luckily, the equipment was able to be salvaged and cleaned.

Key Facts about the Bottom Quark:

- It is a product in most top quark decays as well as the decay of the Higgs Boson.
- Via the weak interaction, the bottom quark can decay into an up or charm quark.
- It is about four times as massive as a proton and has a charge of -1/3 e.

Sources: http://history.fnal.gov/botqrk.html, http://www.osti.gov/accomplishments/lederman.html, http://en.wikipedia.org/wiki/Bottom_quark

Leading up to the Discovery:

For some time, it was believed that matter was made up of just two quarks: the "up" quark and the "down" quark. Some particles that last for a very short period of time (< ten millionths of a second), however, consist of another quark, called the "strange" quark.

The fourth quark, the "charmed" quark was discovered in 1974. (Many of the contributions were also done at Fermilab.) Then, in 1977, the Upsilon particle was discovered by Lederman and colleagues.

Importance of this Work:

The discovery of the Upsilon provided evidence for a fifth quark (the bottom quark).